PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 28 September 2000 (28.09.00)	
International application No. PCT/SE00/00113	**Applicant's or agent's file reference** 980166PC
International filing date (day/month/year) 20 January 2000 (20.01.00)	**Priority date** (day/month/year) 02 February 1999 (02.02.99)
Applicant ECKERBOM, Anders et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

05 July 2000 (05.07.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Charlotte ENGER
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 980166PC	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/SE 00/00113	International filing date *(day/month/year)* 20 January 2000	(Earliest) Priority Date *(day/month/year)* 2 February 1999
Applicant Artema Medical AB		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. [ ] **Certain claims were found unsearchable** (See Box I).

2. [ ] **Unity of invention is lacking** (See Box II).

3. [ ] The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
   - [ ] filed with the international application.
   - [ ] furnished by the applicant separately from the international application,
     - [ ] but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
   - [ ] transcribed by this Authority.

4. With regard to the title,
   - [ ] the text is approved as submitted by the applicant.
   - [X] the text has been established by this Authority to read as follows:

     Liquid separator with holder unit.

5. With regard to the **abstract**,
   - [X] the text is approved as submitted by the applicant.
   - [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:

   Figure No. 1
   - [ ] as suggested by the applicant.
   - [X] because the applicant failed to suggest a figure.
   - [ ] because this figure better characterizes the invention.
   - [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00113

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61M 16/08, A61B 5/08
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61B, A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0242790 A2 (SPACELABS, INC.), 28 October 1987 (28.10.87), page 1, line 28 - page 2, line 9; page 4, line 20 - line 26, figure 3 --	1-7
A	EP 0549266 A2 (INSTRUMENTARIUM CORPORATION), 30 June 1993 (30.06.93), figure 2, abstract --	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 June 2000	26 -06- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Cilla Lyckman/AE Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/12/99

Inte[redacted]nal application No.
PCT/SE 00/00113

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0242790 A2	28/10/87	AT 72951 T	15/03/92
		CA 1302304 A	02/06/92
		DE 3776948 A	09/04/92
		JP 63023643 A	30/01/88
		US 4717403 A	05/01/88
EP 0549266 A2	30/06/93	FI 92138 B,C	30/06/94
		FI 916041 A	21/06/93
		US 5365938 A	22/11/94

PCT REQUEST 980166PC

Original (for **SUBMISSION**) - printed on 20.01.2000 11:04:03 AM

0	**For receiving Office use only**	
0-1	International Application No.	PCT/SE 00/00113
0-2	International Filing Date	20-01-2000
0-3	Name of receiving Office and "PCT International Application"	The Swedish Patent Office PCT International Application
0-4	**Form - PCT/RO/101 PCT Request**	
0-4-1	Prepared using	PCT-EASY Version 2.90 (updated 15.12.1999)
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	Swedish Patent Office (RO/SE)
0-7	**Applicant's or agent's file reference**	980166PC
I	**Title of invention**	LIQUID SEPARATOR
II	**Applicant**	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	ARTEMA MEDICAL AB
II-5	Address:	Rissneleden 136 S-174 57 SUNDBYBERG Sweden
II-6	State of nationality	SE
II-7	State of residence	SE
III-1	**Applicant and/or inventor**	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	ECKERBOM, Anders
III-1-5	Address:	Pl 669 S-185 41 VAXHOLM Sweden
III-1-6	State of nationality	SE
III-1-7	State of residence	SE
III-2	**Applicant and/or inventor**	
III-2-1	This person is:	applicant and inventor
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	LINDESTAM, Per
III-2-5	Address:	Bolindervägen 113 S-176 54 JÄRFÄLLA Sweden
III-2-6	State of nationality	SE
III-2-7	State of residence	SE

PCT REQUEST 980166PC

Original (for **SUBMISSION**) - printed on 20.01.2000 11:04:03 AM

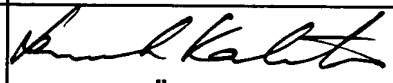
IV-1	**Agent or common repres ntativ ; or address for rresp nd nce** The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name (LAST, First)	KARLSTRÖM, Lennart
IV-1-2	Address:	Noréns Patentbyrå AB Box 10198 S-100 55 STOCKHOLM Sweden
IV-1-3	Telephone No.	+46 8 545 874 00
IV-1-4	Facsimile No.	+46 8 545 874 29
IV-1-5	e-mail	norens@norenspat.se
IV-2	**Additional agent(s)**	additional agent(s) with same address as first named agent
IV-2-1	Name(s)	ÖRTENBLAD, Bertil
V	**Designation of States**	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CR CU CZ DE DK DM EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

PCT REQUEST

980166PC

Original (for **SUBMISSION**) - printed n 20.01.2000 11:04:03 AM

V-5	**Precauti nary Designati n Statem nt** In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	**Exclusion(s) from precautionary designations**	NONE
VI-1	**Priority claim of earlier national application**	
VI-1-1	Filing date	02 February 1999 (02.02.1999)
VI-1-2	Number	9900351-9
VI-1-3	Country	SE
VI-2	**Priority document request** The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1
VII-1	**International Searching Authority Chosen**	Swedish Patent Office (ISA/SE)
VII-2	**Request to use results of earlier search; reference to that search**	
VII-2-1	Date	17 September 1999 (17.09.1999)
VII-2-2	Number	9900351-9
VII-2-3	Country (or regional Office)	SE

VIII	**Check list**	number of sheets	electronic file(s) attached
VIII-1	Request	4 ✓	-
VIII-2	Description	7 ✓	-
VIII-3	Claims	2 ✓	-
VIII-4	Abstract	1 ✓	980166pc.txt
VIII-5	Drawings	3 ✓	-
VIII-7	TOTAL	17 ✓	
	Accompanying items	paper document(s) attached	electronic file(s) attach d
VIII-8	Fee calculation sheet	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-18	**Figure of the drawings which should accompany the abstract**	1	
VIII-19	**Language of filing of the international application**	Swedish	
IX-1	**Signature of applicant or agent**		
IX-1-1	Name (LAST, First)	KARLSTRÖM, Lennart	

FOR RECEIVING OFFICE USE ONLY

10-1	**Date of actual receipt of the purp rted internati nal application**	20-01-2000

PCT REQUEST

980166PC

Original (for **SUBMISSION**) - printed on 20.01.2000 11:04:03 AM

10-2 10-2-1 10-2-2	**Drawings:** Received Not received	α Received
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/SE
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	13 MARCH 2000 (13.03.00)

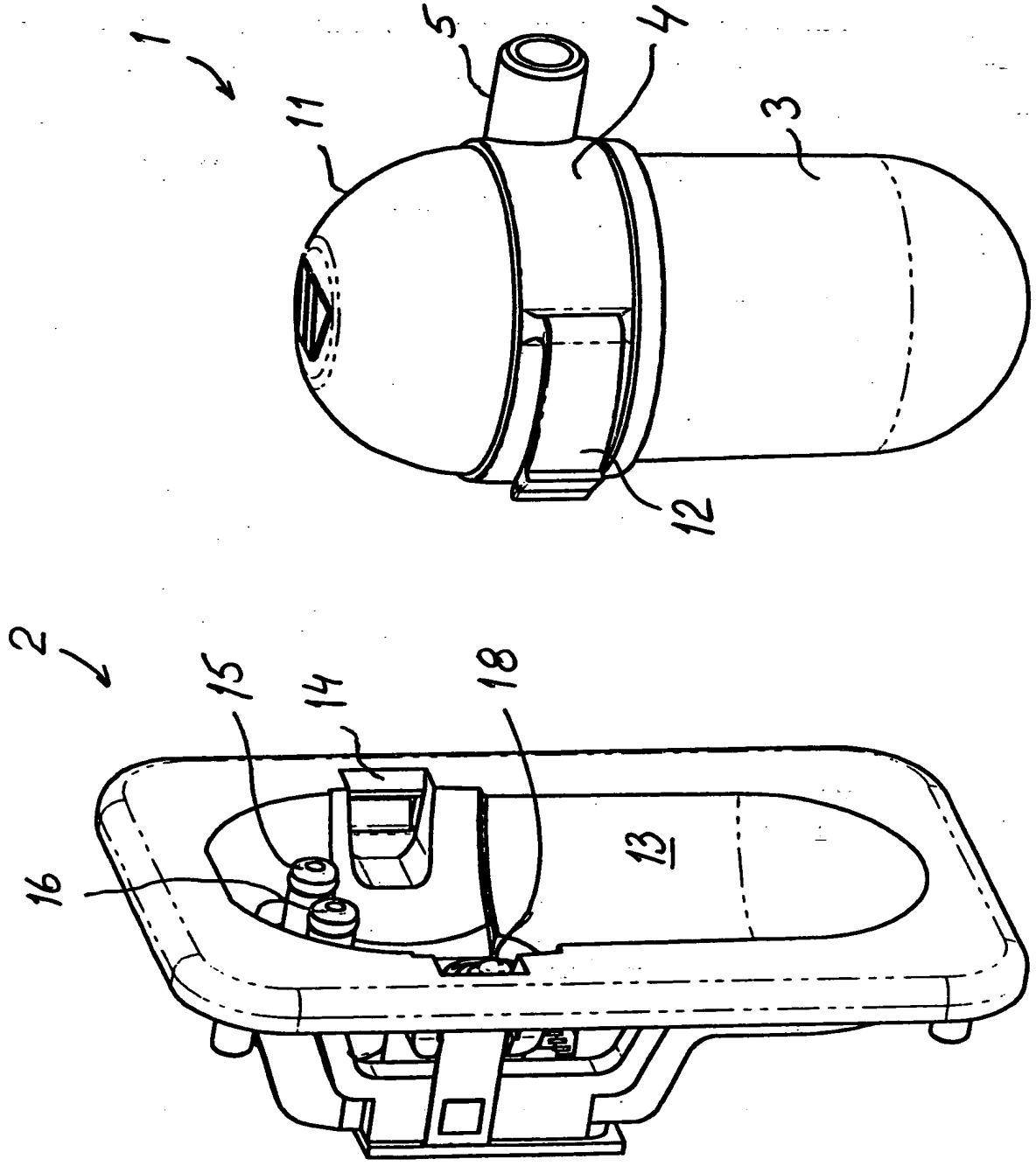


Fig. 1

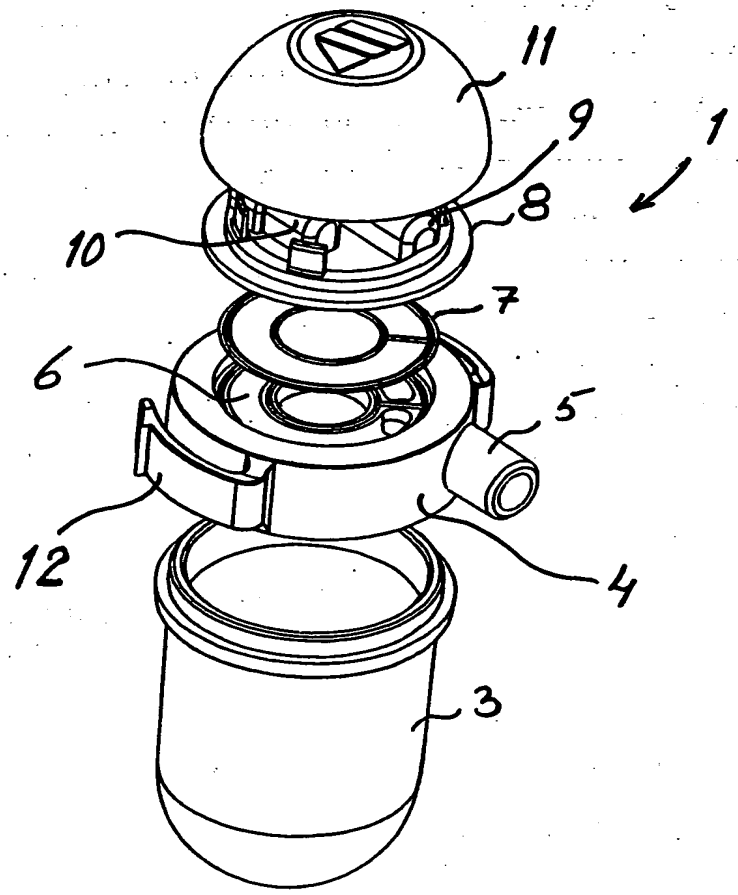


Fig. 2

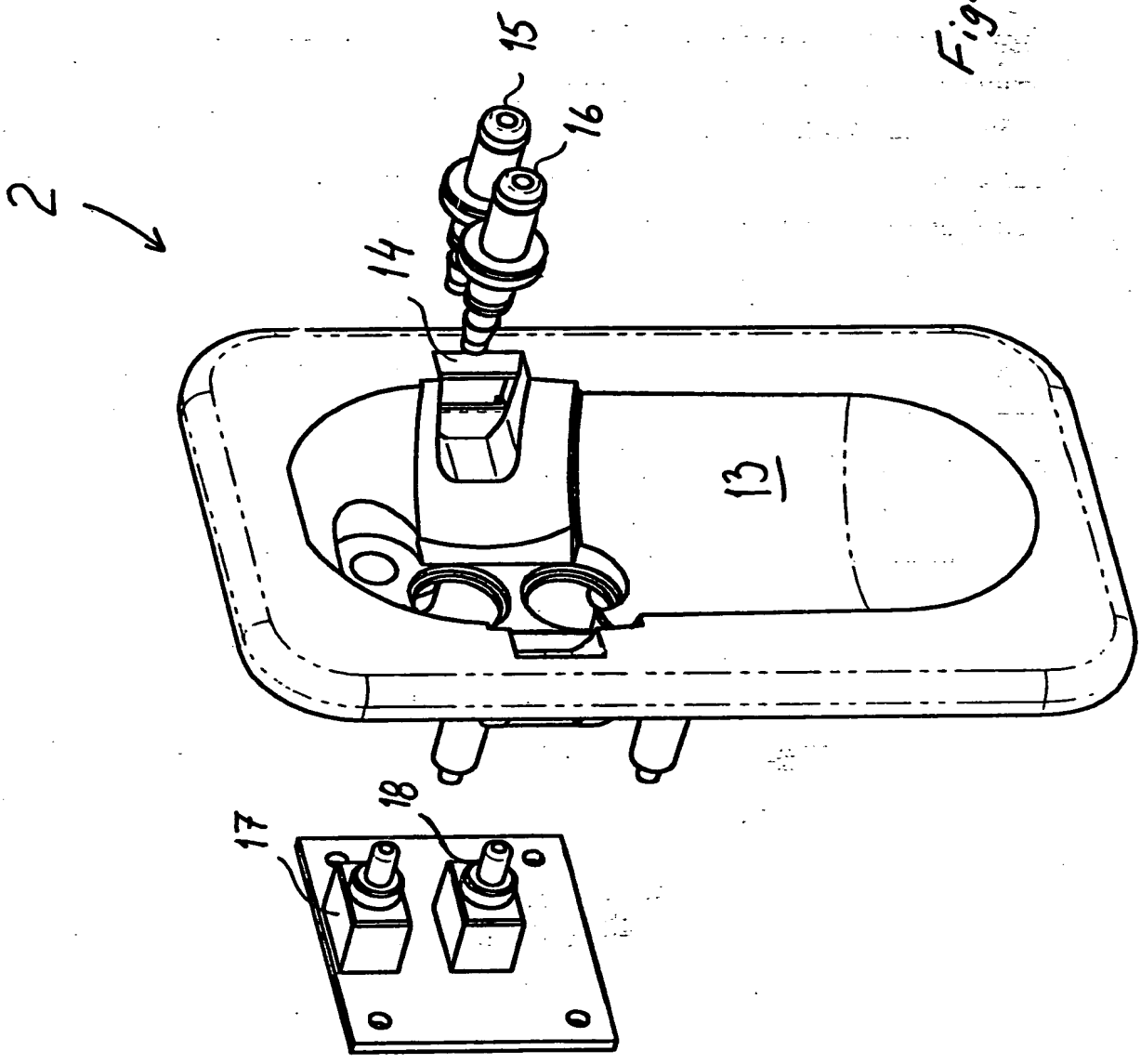


Fig.3

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :
A61M 16/08, A61B 5/08

A1

(11) International Publication Number: WO 00/45884

(43) International Publication Date: 10 August 2000 (10.08.00)

(21) International Application Number: PCT/SE00/00113

(22) International Filing Date: 20 January 2000 (20.01.00)

(30) Priority Data:
9900351-9 2 February 1999 (02.02.99) SE

(71) Applicant *(for all designated States except US)*: ARTEMA MEDICAL AB [SE/SE]; Rissneleden 136, S-174 57 Sundbyberg (SE).

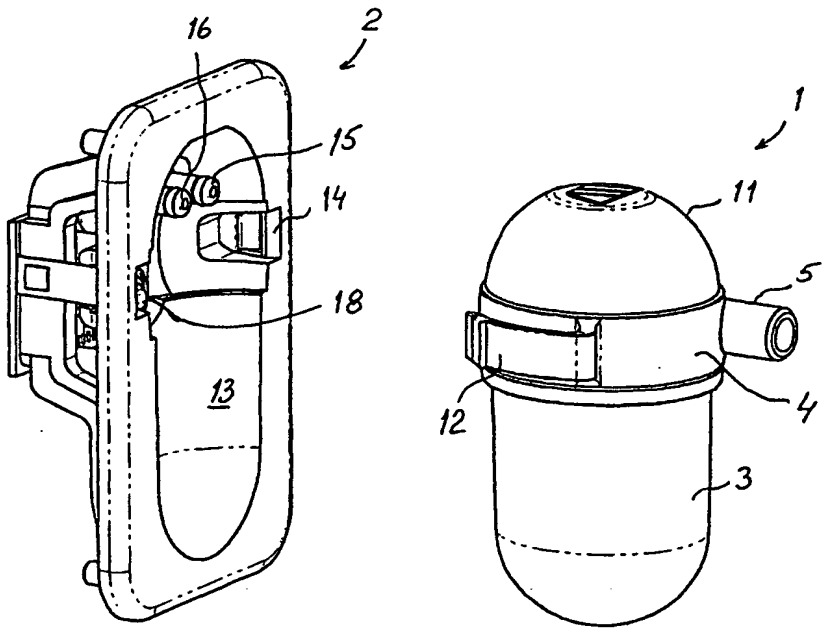
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: ECKERBOM, Anders [SE/SE]; Pl 669, S-185 41 Vaxholm (SE). LINDESTAM, Per [SE/SE]; Bolindervägen 113, S-176 54 Järfälla (SE).

(74) Agents: KARLSTRÖM, Lennart et al.; Noréns Patentbyrå AB, Box 10198, S-100 55 Stockholm (SE).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.
In English translation (filed in Swedish).

(54) Title: LIQUID SEPARATOR WITH HOLDER UNIT



(57) Abstract

The present invention relates to a liquid separator for separating liquid from gases, comprising a water trap (1) that includes a container (5), a connector (5) for incoming gas flow, a separation chamber (4) that includes a filter and at least one connection passageway for leading separated gas to an analysis instrument, wherein the water trap (1) can be removably fitted in a holder unit (2) connected to the analysis instrument, and wherein the holder unit (2) includes connection devices (15, 16) for receiving the connection passageway.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

LIQUID SEPARATOR WITH HOLDER UNIT

The present invention relates to a liquid separator for separating liquid from gases, and particularly for separating liquids from expiration gases in medical analysis instruments.

When a gas sample from expiration gases is led in a patient circuit to an analysis instrument, it is unavoidable that moisture, secretion, blood, bacteria, etc., are liable to accompany the sample. As the temperature falls when the gas sample is led from the patient circuit to the analysis instrument, moisture present in the gas precipitates in the form of water droplets. Should water, blood or secretion enter the analysis instrument, there is a serious risk that the instrument will be permanently damaged, and consequently various protective solutions for preventing such contamination have been proposed in the art.

The simplest method of avoiding the ingress of bacteria, blood and secretion into the gas sample is to place a hydrophobic bacteria filter in the orifice of the sampling conduit proximal to the patient circuit. One drawback with this solution resides in the difficulty of obtaining a filter surface, which is sufficiently large to prevent the rise time of the gas measuring process from being impaired. A filter that has a small surface area will quickly become blocked and therewith result in an interruption in the gas monitoring process.

The presence of a bacteria filter in the orifice of the sampling conduit will not solve the moisture problem, because the moisture does not precipitate from the sample until the

sample is downstream of the filter. One solution to this problem is to use a special hose material, Nafion®, which allows moisture to wander freely through the hose wall. This material, however, is very expensive which makes it difficult to obtain viable products when using said material.

Alternatively, water droplets, and possibly also secretion, can be separated from expiration gas in a water trap. A positive, inexpensive and effective separator can be obtained, by combining the water trap with a bacteria filter. However, one drawback with this solution is that the rise time of the gas measuring process will be seriously impaired unless the water trap is adapted with respect to the volume of gas that shall be processed at that particular time.

The need for a short rise time is particularly accentuated when measuring the expiration gas of newly born infants, e.g. neonatal patients. Small children usually have a considerably higher respiration rate than adults. 40-60 breaths per minute is normal for such infants, as compared to about 12 breaths per minute for adults. Thus, in this case the gas sampling system must have a pneumatic rise time of well above 0.5 s in order to carry out a correct gas analysis with respect to time, a rise time of 200 ms being an appropriate value in this respect.

The pneumatic rise time of the gas sampling system is essentially inversely proportional to the sampling flow, in other words a high rate of flow results in a short rise time. Respiration volumes of several litres are normal in the case of adult patients, which enables sample flow rates in the order of 200-300 ml/min to be used without influencing the respiratory circuit. However, in the case of neonatal patients,

which have respiratory volumes in the order of decilitres, it is necessary to lower the rate of flow to a minimum. 50 ml/min is a normal flow rate in this latter case. Consequently, when the need for a short rise time is greatest, the possibilities of achieving such a rise time are the worst.

In addition to needing to extract moisture, bacteria, etc., from the expiration gas of a patient, it is also necessary to protect the analysis instrument from dirt and other contaminants present in the ambient air. Many gas analysis instruments have long warm-up times, meaning that the instrument is normally never switched off. Consequently, if the instrument is left switched on for a long period of time in the absence of a protective filter, the measuring chamber of the analyser will gradually become dirty with progressively poorer performances as a result.

Water traps have been the solution that has been used to increasing extents to eliminate moisture in gas samples. EP-A2-0 549 266 teaches a method of extracting both moisture and other foreign particles with the aid of a hydrophobic bacteria filter. In the case of the water trap described in this prior publication, the gas sample is passed through a passageway that is divided in an upper half and a lower half of the hydrophobic filter. The moist gas sample is led into the front edge of the lower half of a passageway and is caused to exit by applying a strong sub-pressure to an opening in the rear edge of the upper half of said passageway. The liquid extracted by this arrangement is led away by applying a weak sub-pressure to an opening in the rear edge of the lower half of the passageway.

One drawback with this known water trap is that it requires a relatively large filter area, about 1 cm^2, in order to ensure that the product will have a sufficient length of life. The length of the passageway is limited chiefly by the desire to obtain the smallest possible unit. A length of about 3.5 cm has been found suitable. Consequently, a passageway diameter of about 3 mm is needed in order to obtain an effective filter surface. Hoses used for gas sampling purposes, however, will normally have an inner diameter of about 1.4-1.5 mm, meaning that eddy currents are generated and impaired rise time obtained when the gas sample reaches the larger diameter of the passageway.

Accordingly, the object of the present invention is to provide a liquid separator that avoids the aforesaid drawback with the earlier known water trap.

This object is achieved with an inventive liquid separator that has the characteristic features set forth in the accompanying Claims.

There is provided in accordance with the invention a liquid separator for extracting liquid from gases, said separator comprising a water trap that includes a container, a connection for incoming gas flows, a separation chamber that includes a filter, and at least one connection passageway for conducting separated gas to an analysis instrument, wherein the water trap can be attached removably to a holder unit connected to the analysis instrument, and wherein the holder unit includes connection means for connection of the connecting passageway.

The invention also enables water traps of different sizes to be used for adults and for children, with automatic switching of the analysis instrument in accordance with the size of water trap used.

The invention will now be described with reference to a non-limiting exemplifying embodiment thereof and also with reference to the accompanying drawings, in which **Fig. 1** is a perspective view of an inventive liquid separator, showing the water trap and the holder unit separated from one another; **Fig. 2** is a perspective exploded view of the water trap shown in Fig. 1; and **Fig. 3** is a perspective exploded view of the holder unit shown in Fig. 1.

The inventive liquid separator comprises two main parts in the form of a water trap 1 and a holder unit 2. The holder unit 2 is a part that can normally be firmly fitted to the instrument (not shown) used to analyse expiration gas. The water trap 1 is a disposable product that is preferably found in two different sizes or two different designs, one for adult patients and one for neonatal patients.

The water trap 1 includes a container 3 located beneath a separation chamber 4 provided with a connection 5 for receiving a gas flow incoming from the patient. The separation chamber includes a liquid passageway 6 and a filter 7 positioned above said passageway, for instance a bacteria filter. Located above the separation chamber 4 and connecting to the other side of the filter 7 is an upper chamber part 8 that includes a gas passageway (not shown) corresponding to the liquid passageway 6 in the separation chamber and leading to connection passageways 9, 10 by means of which the water trap can be connected to the holder unit 2 and to the analysis

instrument respectively. The upper chamber part 8 is covered by a hood or cap 11. The separation chamber 4 is fitted externally with locking tabs 12 which enable the water trap 1 to be snapped firmly to the holder unit 2.

The separation chamber 4 is preferably fixed permanently to the upper chamber part 8, for instance ultrasound welded thereto. The filter 7, which is inserted between the separation chamber and the upper chamber part 8, may be of the PTFE kind and has a pore size of about 0.5 μm and may be sealed with the aid of a labyrinth seal formed in the separation chamber and the upper chamber part. The container 3 of the water trap is adapted so as to be removable from the separation chamber 4 and therewith enable liquid collected in the container to be emptied therefrom.

The holder unit 2 includes a cavity 13 in which part of the water trap 1 can be accommodated. The holder unit includes locking apertures 14 which receive the locking tabs 12 on the water trap and therewith lock the trap 1 firmly in the holder unit. Two connection devices 15, 16 are provided behind the cavity 13 for receiving the connection passageways of the water trap 1. These connection devices 15, 16 are connected to hoses passing to the analysis instrument. Two electric contact elements 17, 18 are provided in the rear edge of the cavity 13 and are activated by insertion of a water trap 1 into the cavity 13 of the holder unit 2.

The electric contact elements 17, 18 are adapted so that one contact element will detect the presence of a water trap in the holder unit, wherewith when the water trap 1 is removed from the holder unit 2 the contact element will function to immediately stop the flow to the analysis instrument, or will

stop said flow after a certain time delay, so that no air and possible contaminants will be sucked into the instrument and contaminate the same. The other electric contact element is adapted to detect the type of water trap inserted into the holder unit. The two different types of water trap mentioned above may be designed differently at the contact region with said other electric contact element, for instance such that when using a water trap intended for children the contact will be pressed in, while providing a water trap intended for adult patients with an aperture which will mean that said other electric contact will not be pressed in when fitting said trap. The second electric contact element will then be arranged so that when it is pressed-in by fitting a water trap intended for neonatal patients, the analysis instrument will be switched to a mode in which it operates with a lower rate of flow.

The two connection passageways 9, 10 are connected to the connection devices 15, 16 of the holder unit 2 so that both a main flow that passes from the water trap to the analysis instrument and a secondary flow that passes through the container of the water trap can be obtained.

The main difference between the two water trap embodiments is that one is intended for adult patients and has a passageway width of about 3 mm, whereas the neonatal model has a passageway width of about 1.4 mm. The smaller passageway width in the neonatal model means that the rise time will be much quicker than in the case of the adult model. In this case, the problems normally occurring with shorter product life lengths are compensated for by using a lower rate of sample flow.

Because the type of water trap used can be identified, the analysis instrument can be set automatically to choose an optimal rate of sample flow for respective models through the medium of said electric contact elements. In the case of the adult model, there is normally used a flow rate in the order of 200-300 ml/min, whereas a flow rate of about 50 ml/min is normally used in the case of the neonatal model. Switching between these flow rates can thus take place fully automatically, without the risk of a wrong setting being made manually.

CLAIMS

1. A liquid separator for separating liquid from gases and comprising a water trap (1) that includes a container (3), a connection (5) for incoming gas flow, a separation chamber (4) that includes a filter (7), and at least one connection passageway (9, 10) for leading liquid-free gas to an analysis instrument, **characterised** in that the water trap (1) can be removably fitted in a holder unit (2) connected to the analysis instrument; and in that the holder unit (2) is provided with connection devices (15, 16) for accommodating the connection passageway (9, 10).

2. A liquid separator according to Claim 1, **characterised** in that the connection device (15, 16) is a quick-fastener device for connection to the connection passageway (9, 10).

3. A liquid separator according to Claims 1 and 2, **characterised** in that the water trap (1) includes two connection passageways (9, 10), and in that the holder unit (2) includes two connection devices (15, 16).

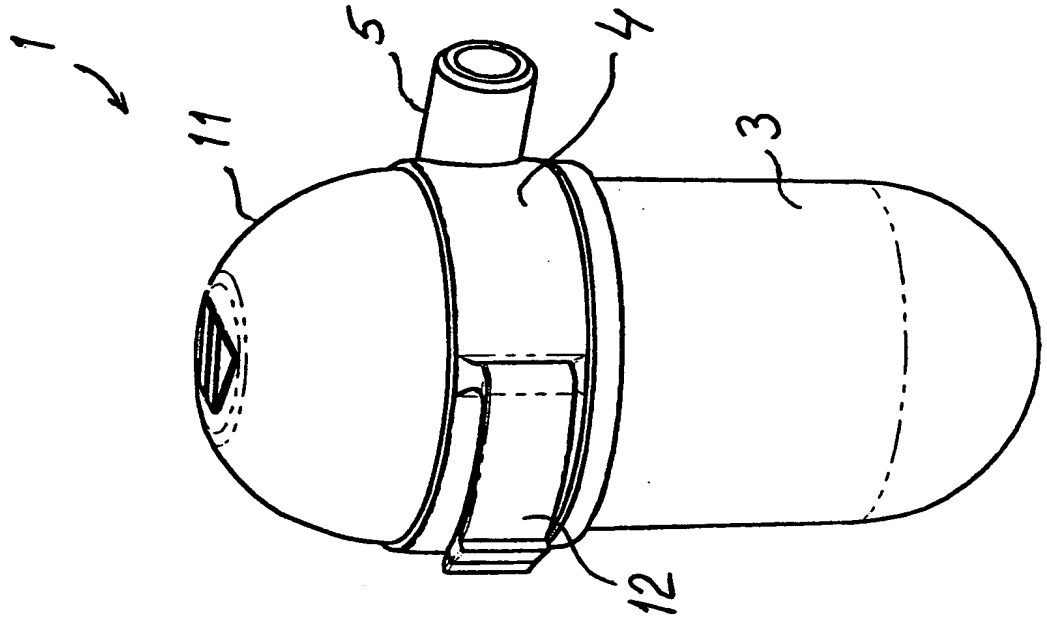
4. A liquid separator according to any one of the preceding Claims, **characterised** in that the holder unit (2) includes a first electric contact element (18) which functions to detect the presence of a liquid trap (1) in the holder unit and to stop the flow of sample gas to the analysis instrument when no water trap is fitted in the holder unit.

5. A liquid separator according to any one of the preceding Claims, **characterised** in that the holder unit (2) includes a second electric contact element (17) which functions to detect the type of water trap (1) fitted in the holder unit and

to adjust the analysis instrument in accordance with the type of water trap used.

6. A liquid separator according to Claim 5, **characterised** in that the water trap (1) is designed in different sizes for infants and adults; and in that one size includes means for actuating the second electric contact element (17) of the holder unit.

7. A liquid separator according to any one of the preceding Claims, **characterised** in that the water trap (1) is intended for one-time use only.



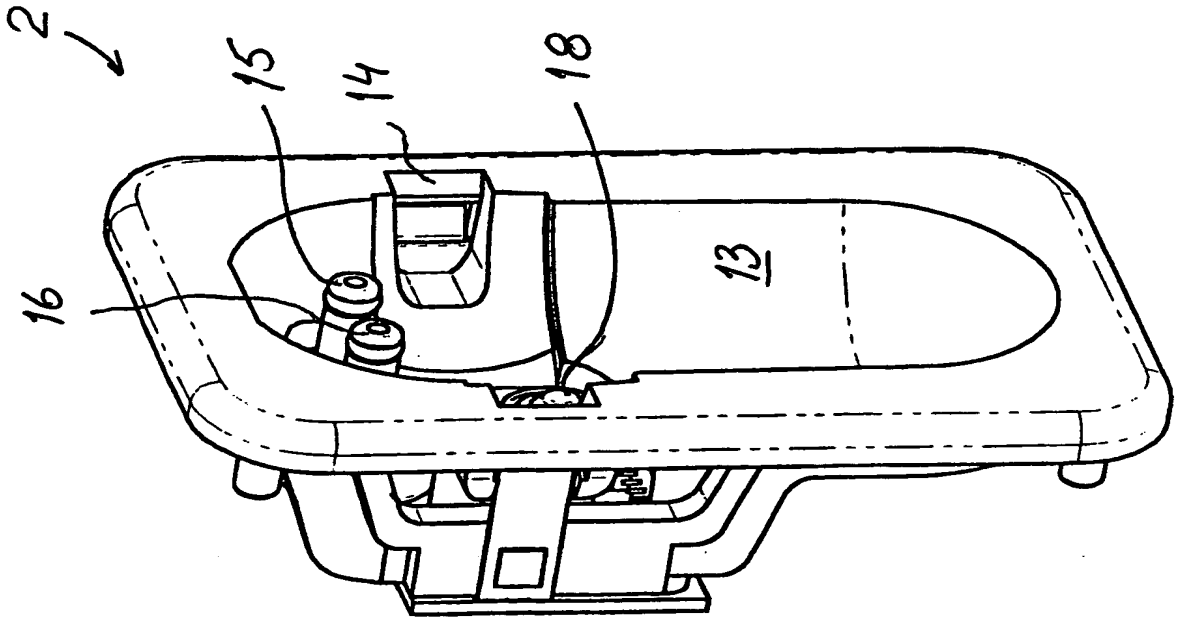


Fig. 1

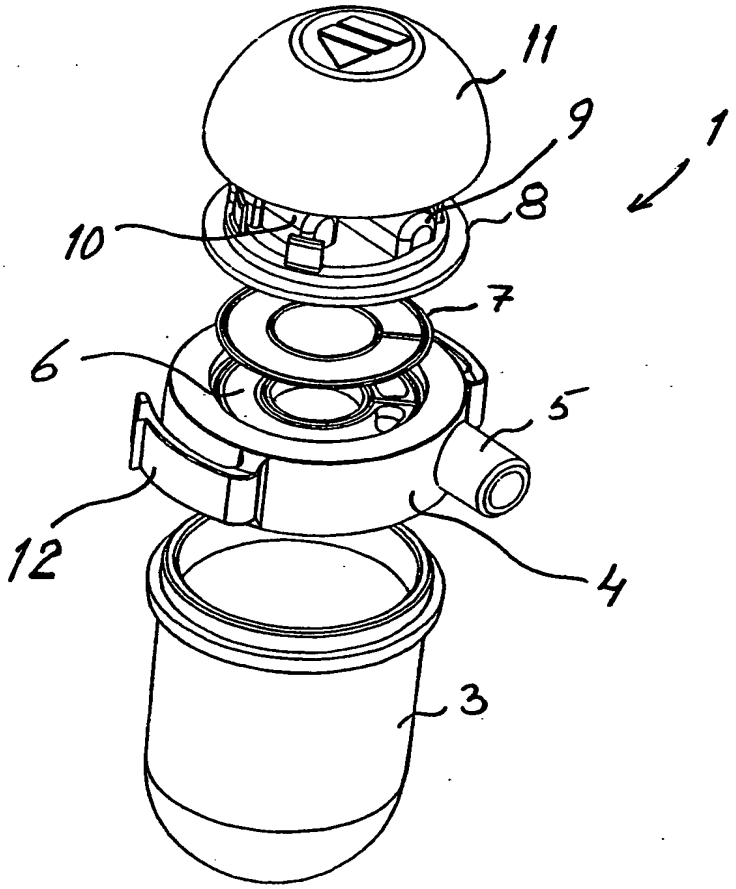


Fig. 2

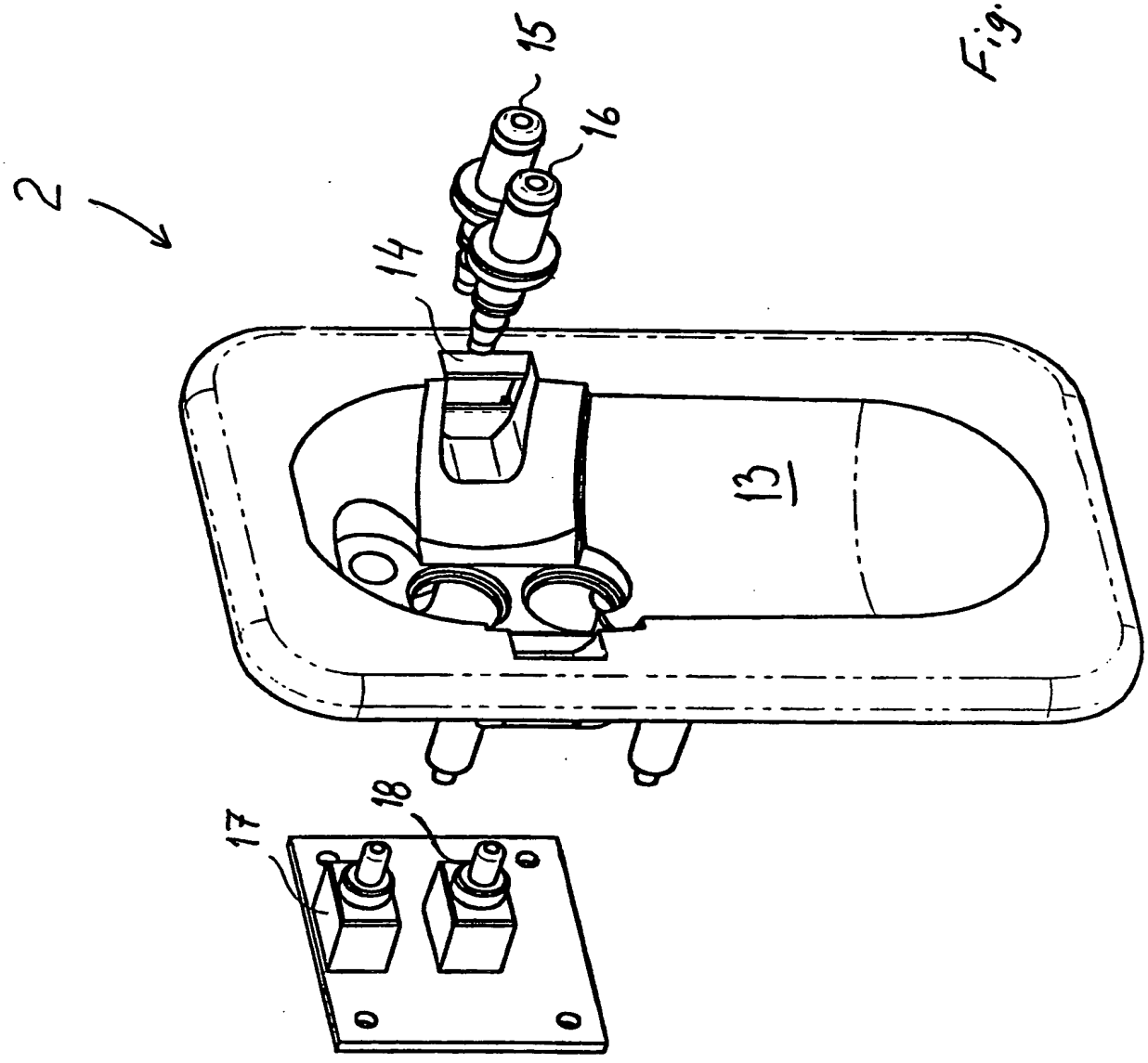


Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00113

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61M 16/08, A61B 5/08
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61B, A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0242790 A2 (SPACELABS, INC.), 28 October 1987 (28.10.87), page 1, line 28 - page 2, line 9; page 4, line 20 - line 26, figure 3 --	1-7
A	EP 0549266 A2 (INSTRUMENTARIUM CORPORATION), 30 June 1993 (30.06.93), figure 2, abstract --	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 June 2000	26 -06- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Cilla Lyckman/AE Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 00/00113

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0242790 A2	28/10/87	AT 72951 T	15/03/92
		CA 1302304 A	02/06/92
		DE 3776948 A	09/04/92
		JP 63023643 A	30/01/88
		US 4717403 A	05/01/88
EP 0549266 A2	30/06/93	FI 92138 B,C	30/06/94
		FI 916041 A	21/06/93
		US 5365938 A	22/11/94

Vätskeavskiljar

Föreliggande uppfinning avser en vätskeavskiljare för avskiljning av vätska från gaser, speciellt för avskiljning av vätskor från utandningsgaser vid medicinska analysinstrument.

När ett gasprov från utandningsgaserna i en patientkrets leds till ett analysinstrument är det oundvikligt att även fukt, sekret, blod, bakterier etc. kan följa med gasprovet. Eftersom temperaturen sjunker när gasprovet leds från patientkretsen till analysinstrumentet kommer fuktinnehållet i gasen att fällas ut som vattendroppar. Om vatten, blod eller sekret kommer in i analysinstrumentet finns stor risk för skador, även permanenta skador, på analysinstrumentet, varför olika skyddslösningar för att förhindra en sådan kontaminering har utvecklats.

Det enklaste sättet för att undvika bakterier, blod och sekret i gasprovet är att placera ett hydrofobt bakteriefilter i samplingsledningens mynning mot patientkretsen. En nackdel med denna lösning är svårigheten att få en tillräckligt stor filteryta för att gasmätningens stigtid inte ska försämras. Med en liten yta sätts filtret snabbt igen, vilket leder till avbrott i gasövervakningen.

Ett bakteriefilter i samplingsledningens mynning löser inte heller problemet med fukten, eftersom fukten fälls ut först efter filtret. En lösning på detta problem är att använda ett speciellt slangmaterial, Nafion®, som tillåter fukt att fritt vandra genom slangväggen. Detta material är emellertid mycket dyrt, vilket gör att det är svårt att få lönsamma produkter vid användning av detta material.

Ett annat sätt att avskilja vattendroppar är att avskilja dessa, och eventuellt sekret, i en vattenfälla. Om vattenfällan kombineras med ett bakteriefilter kan en säker, billig och väl fungerande avskiljningsanordning förverkligas. En nackdel med denna lösning är dock att gasmätningens stigtid kan försämras kraftigt om inte vattenfällan är avpassad för den gasmängd som den ska behandla vid det aktuella fallet.

Behovet av kort stigtid är speciellt accentuerat vid mätning på nyfödda barn, neonatala patienter. Små barn har vanligen en avsevärt högre andningsfrekvens än vuxna, 40 - 60 andetag per minut är vanligt, jämfört med ca. 12 andetag per minut för vuxna. För att kunna klara en korrekt tidsupplöst gasanalys måste i detta fall gassamplingssystemet ha en pneumatisk stigtid väl understigande 0,5 s. 200 ms är ett lämpligt riktvärde.

Gassamplingssystemets pneumatiska stigtid är nära nog omvänt proportionell mot samplingsflödet, högt flöde medför således kort stigtid. I fallet med vuxna patienter är andetagsvolymer om flera liter normalt, vilket möjliggör provflöden i storleksordningen 200-300 ml/min utan inverkan på andningskretsen. För neonatala patienter, som har andetagsvolymer i storleksordningen deciliter, måste dock provflödet sänkas till ett minimum. 50 ml/min är då vanligt. Resultatet av detta förhållande blir således att när behovet av kort stigtid är som störst är möjligheterna som sämst.

Förutom behovet av att avskilja fukt, bakterier mm. från patienten måste analysinstrumentet också skyddas från smuts och andra föroreningar som finns i omgivningsluften. Många gasanalysinstrument har lång uppvärmningstid, vilket gör att det är vanligt att instrumentet i princip aldrig stängs av.

Om instrumentet därför under längre tid lämnas påslaget utan skyddande filter kommer analysatorns mätkammare gradvis att smutsas ner, med allt sämre prestanda som följd.

För att eliminera fukt i gasprover har vattenfällor blivit den allt mer använda lösningen. I EP-A2-0 549 266 beskrivs ett sätt för att avskilja både fukt och andra främmande partiklar i ett hydrofobt bakteriefilter. I den där visade vattenfällan leds gasprovet genom en kanal som avdelas i en övre och en undre halva av det hydrofoba filtret. Det fuktiga gasprovet leds in i framkanten av kanalens undre halva och avleds genom ett starkt undertryck som påläggs en öppning i bakkanten av kanalens övre halva. Vätskan som avskilts av anordningen avleds genom ett svagt undertryck som påläggs en öppning i bakkanten av kanalens undre halva.

En nackdel med denna kända vattenfälla är att den kräver en relativt stor filteryta, ca. 1 cm^2, för att erhålla en tillräcklig livslängd på produkten. Kanalens längd begränsas huvudsakligen av att man önskar göra en så liten enhet som möjligt. En längd av ca. 3,5 cm har visat sig lämplig. För att uppnå en tillräcklig filteryta krävs därför en kanaldiameter av ca. 3 mm. Normala slangar för gasprovtagning har dock en innerdiameter av ca. 1,4-1,5 mm, vilket medför att virvelbildning åstadkommes och en försämrad stigtid erhålles när gasprovet når kanalens större diameter.

Ändamålet med föreliggande uppfinning är därför att åstadkomma en vätskeavskiljare som undanröjer den ovannämnda nackdelen med den tidigare kända vattenfällan.

Ovannämnda ändamål med uppfinningen har uppnåtts genom att uppfinningen har erhållit de i patentkraven angivna särdragen.

Med uppfinningen åstadkommes en vätskeavskiljare för avskiljning av vätska från gaser, innefattande en vattenfälla med en behållare, en anslutning för inkommande gasflöde, en separeringskammare med ett filter och åtminstone en anslutningskanal för att leda avskild gas till ett analysinstrument, där vattenfällan är lösbart fastsättbar i en hållarenhet som är förbunden med analysinstrumentet, och hållarenheten är försedd med anslutningsorgan för upptagande av anslutningskanalen.

Uppfinningen åstadkommer också möjligheten att ha olika stora vattenfällor för vuxna och för barn, med en automatisk omkoppling av analysinstrumentet beroende på vilken storlek av vattenfälla som användes.

Uppfinningen kommer nu att beskrivas i form av ett icke begränsande utföringsexempel åskådliggjort på de bifogade ritningsfigurerna, där **Fig. 1** i en perspektivvy visar en vätskeavskiljare enligt uppfinningen, med vattenfälla och hållarenhet separerade från varandra, **Fig. 2** visar en perspektivisk sprängvy av vattenfällan i Fig. 1, och **Fig. 3** visar en perspektivisk sprängvy av hållarenheten i Fig. 1.

Vätskeavskiljaren enligt uppfinningen innefattar två huvuddelar, en vattenfälla 1 och en hållarenhet 2. Hållarenheten 2 är en del som normalt monteras fast i det analysinstrument, icke visat, som användes för analys av utandningsgas. Vattenfällan 1 är en engångsprodukt, som bör finnas i två olika

storlekar eller utföringsformer, en för vuxna patienter och en för neonatala patienter.

Vattenfällan 1 innefattar en behållare 3, belägen under en separeringskammare 4, försedd med en anslutning 5 från patienten för inkommande gasflöde. I separeringskammaren finns en vätskekanal 6, och ovanpå denna ett filter 7, t.ex. ett bakteriefilter. Ovanpå separeringskammaren 4, och anslutande till andra sidan av filtret 7 finns en övre kammardel 8, som innehåller en gaskanal, icke visad, motsvarande vätskekanalen 6 i separeringskammaren, ledande till anslutningskanaler 9, 10, med vilka vattenfällan kan anslutas till hållarenheten 2 och analysinstrumentet. Den övre kammardelen 8 är täckt av en kåpa 11. Utvändigt på separeringskammaren 4 finns låstungor 12, med vilka vattenfällan 1 kan fastsnäppas i hållarenheten 2.

Separeringskammaren 4 är lämpligen permanent fastsatt vid den övre kammardelen 8, exempelvis genom ultraljudssvetsning. Filtret 7 som är insatt mellan separeringskammaren och den övre kammardelen 8 kan vara av PTFE-typ och ha en porstorlek av ca. 0,5 μm kan vara tätat med hjälp av en labyrinttätning bildad i separeringskammaren och den övre kammardelen. Vattenfällans behållare 3 är anordnad att kunna lossas från separeringskammaren 4, för att medge tömning av i behållaren uppsamlad vätska.

Hållarenheten 2 innefattar en urtagning 13 i vilken en del av vattenfällan 1 kan upptagas. I hållarenheten finns låsurtag 14 för upptagande av vattenfällans låstungor 12, och fastlåsning av vattenfällan 1 i hållarenheten. Baktill i urtagningen 13 finns två anslutningsorgan 15, 16 för upptagande av anslutningskanalerna hos vattenfällan 1. Dessa anslutningsorgan

15, 16 är förbundna med slangar ledande till analysinstrumentet. I bakkanten på urtagningen 13 finns också två kontaktorgan 17, 18, som påverkas av insättningen av en vattenfälla 1 i hållarenhetens 2 urtagning 13.

Kontaktorganen 17, 18 är anordnade så att den ena av dem känner av förekomsten av en vattenfälla i hållarenheten, och kan då vattenfällan 1 tas bort från hållarenheten 2 vara kopplad att omedelbart, eller efter viss tidsfördröjning, stänga av flödet till analysinstrumentet, så att inte luft med eventuella föroreningar då sugs in i analysinstrumentet och förorenar detta. Det andra av kontaktorganen är anordnat att känna av vilken typ av vattenfälla som är insatt i hållarenheten. De två olika typerna av vattenfälla som nämnts ovan kan vara utformade olika vid kontaktområdet mot det andra kontaktorganet, så att exempelvis vattenfällan avsedd för barn trycker in kontakten, medan en vattenfälla avsedd för vuxna patienter har en urtagning som gör att denna ej trycker in det andra kontaktorganet. Det andra kontaktorganet är då anordnat att, när det är intryckt av förekomsten av en vattenfälla avsedd för neonatala patienter, koppla om analysinstrumentet så att det arbetar med ett lägre provflöde.

De två anslutningskanalerna 9, 10 ansluts till anslutningsorganen 15, 16 hos hållarenheten 2 för att kunna åstadkomma såväl ett huvudflöde som överförs från vattenfällan till analysinstrumentet som ett sekundärflöde som passerar vattenfällans behållare.

Den väsentliga skillnaden mellan de båda utföringsformerna av vattenfällan är att den är avsedd för vuxna patienter och har en kanalbredd på ca. 3 mm, medan neonatalmodellen har en kanalbredd av ca. 1,4 mm. Den mindre kanalbredden i neonatal-

modellen betyder att stigtiden blir snabbare än för vuxenmodellen. De problem som normalt därvid uppkommer med kortare produktlivslängd kompenseras i detta fall genom användningen av ett lägre provflöde.

Genom att typen av vattenfälla kan identifieras blir det möjligt att genom kontaktorganen automatiskt ställa om analysinstrumentet för att välja optimalt provflöde för respektive utförandemodell. För vuxenmodellen användes normalt ett flöde i storleksordningen 200-300 ml/min, medan det för neonatalmodellen normalt användes ett flöde av ca. 50 ml/min. Omkopplingen mellan dessa flöden kan således ske helst automatiskt, utan risk för någon felaktig manuell inställning.

Pat ntkrav

1. Vätskeavskiljare för avskiljning av vätska från gaser, innefattande en vattenfälla (1) med en behållare (3), en anslutning (5) för inkommande gasflöde, en separeringskammare (4) med ett filter (7) och åtminstone en anslutningskanal (9, 10) för att leda en vätskefri gas till ett analysinstrument, k ä n n e t e c k n a d av att vattenfällan (1) är lösbart fastsättbar i en hållarenhet (2) som är förbunden med analysinstrumentet, och hållarenheten (2) är försedd med anslutningsorgan (15, 16) för upptagande av anslutningskanalen (9, 10).

2. Vätskeavskiljare enligt krav 1, k ä n n e t e c k n a d av att anslutningsorganet (15, 16) är ett snabbanslutningsorgan för anslutning till anslutningskanalen (9, 10).

3. Vätskeavskiljare enligt krav 1 och 2, k ä n n e t e c k n a d av att vattenfällan (1) innefattar två anslutningskanaler (9, 10), och hållarenheten (2) innefattar två anslutningsorgan (15, 16).

4. Vätskeavskiljare enligt något av de föregående kraven, k ä n n e t e c k n a d av att hållarenheten (2) är försedd med ett första kontaktorgan (18), för att känna av förekomsten av en vattenfälla (1) i hållarenheten, och för att stänga av ett provflöde till analysinstrumentet när ingen vattenfälla är monterad i hållarenheten.

5. Vätskeavskiljare enligt något av de föregående kraven, k ä n n e t e c k n a d av att hållarenheten (2) är försedd

med ett andra kontaktorgan (17) för att känna av typen av vattenfälla (1) fastsatt i hållarenheten och reglera analysinstrumentet efter typen av vattenfälla.

6. Vätskeavskiljare enligt krav 5, k ä n n e t e c k n a d av att vattenfällan (1) är anordnad i olika storlekar för barn och vuxna, och att den ena storleken har organ för att påverka hållarenhetens kontaktorgan (17).

7. Vätskeavskiljare enligt något av de föregående kraven, k ä n n e t e c k n a d av att vattenfällan (1) är en engångsprodukt.

Sammandrag

Uppfinningen avser en vätskeavskiljare för avskiljning av vätska från gaser, innefattande en vattenfälla (1) med en behållare (3), en anslutning (5) för inkommande gasflöde, en separeringskammare (4) med ett filter och åtminstone en anslutningskanal för att leda avskild gas till ett analysinstrument, där vattenfällan (1) är lösbart fastsättbar i en hållarenhet (2) som är förbunden med analysinstrumentet, och hållarenheten (2) är försedd med anslutningsorgan (15, 16) för upptagande av anslutningskanalen.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 980166PC	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE00/00113	International filing date *(day/month/year)* 20.01.2000	Priority date *(day/month/year)* 02.02.1999
International Patent Classification (IPC) or national classification and IPC7 A 61 M 16/08, A 61 B 5/08		
Applicant Artema Medical AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
05.07.2000	01.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 Telex 17978 PATOREG-S	Authorized officer Cilla Lyckman/mj Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00113

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language English which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☒ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00113

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-7	YES
	Claims		NO
Inventive step (IS)	Claims	1-7	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-7	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The claimed invention relates to a liquid separator for separating of liquids from gases to be analysed in an analysis instrument. The problem the invention is intended to solve is the problem with different rise time for infants and for adults. The filter area and the inner diameter of the analysis instrument are two important parameters affecting the rise time. The problem is solved by manufacturing the liquid separator in two sizes, both sizes fits into the same holder.

In the International Search Report the following documents are cited:
D1: EP 0242790 A2
D2: EP 0549266 A2

The document D1 describes a prior art liquid separator with a holder. The document D2 describes a prior art liquid separator.
The documents D1 and D2 defines the general state of the art and are not considered to be of particular relevance.

The invention claimed in claims 1-7 is new and is considered to involve an inventive step. The invention according to claims 1-7 is considered to be industrially applicable.

PATENT COOPERATION TREATY

PCT

REC'D 20 JUN 2001
WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference 980166PC	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE00/00113	International filing date *(day/month/year)* 20.01.2000	Priority date *(day/month/year)* 02.02.1999
International Patent Classification (IPC) or national classification and IPC7 A 61 M 16/08, A 61 B 5/08		
Applicant Artema Medical AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
05.07.2000	01.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 Telex 17978 PATOREG-S	Authorized officer Cilla Lyckman/mj Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00113

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language English which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☒ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00113

V. Reasoned statement under Article 35(2) with regard t novelty, inventive step or industrial applicability; citati ns and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-7	YES
	Claims		NO
Inventive step (IS)	Claims	1-7	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-7	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The claimed invention relates to a liquid separator for separating of liquids from gases to be analysed in an analysis instrument. The problem the invention is intended to solve is the problem with different rise time for infants and for adults. The filter area and the inner diameter of the analysis instrument are two important parameters affecting the rise time. The problem is solved by manufacturing the liquid separator in two sizes, both sizes fits into the same holder.

In the International Search Report the following documents are cited:
D1: EP 0242790 A2
D2: EP 0549266 A2

The document D1 describes a prior art liquid separator with a holder. The document D2 describes a prior art liquid separator.
The documents D1 and D2 defines the general state of the art and are not considered to be of particular relevance.

The invention claimed in claims 1-7 is new and is considered to involve an inventive step. The invention according to claims 1-7 is considered to be industrially applicable.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00113

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61M 16/08, A61B 5/08
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61B, A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0242790 A2 (SPACELABS, INC.), 28 October 1987 (28.10.87), page 1, line 28 - page 2, line 9; page 4, line 20 - line 26, figure 3 --	1-7
A	EP 0549266 A2 (INSTRUMENTARIUM CORPORATION), 30 June 1993 (30.06.93), figure 2, abstract --	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 June 2000	26 -06- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Cilla Lyckman/AE Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 00/00113

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0242790 A2	28/10/87	AT 72951 T	15/03/92
		CA 1302304 A	02/06/92
		DE 3776948 A	09/04/92
		JP 63023643 A	30/01/88
		US 4717403 A	05/01/88
EP 0549266 A2	30/06/93	FI 92138 B,C	30/06/94
		FI 916041 A	21/06/93
		US 5365938 A	22/11/94